Software Makes a Complex Job Possible

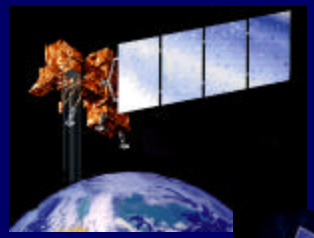
- **Currently operating 10 satellites**
- **11 launches since 1999 (including SRTM and NOAA weather satellites)**
- **15 more launches planned through 2004**

We Will Examine Practically Every Aspect of the Earth System From Space in This Decade

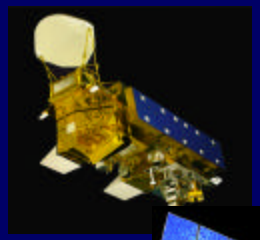
Systematic - Observation of Key Earth System Interactions


Terra


QuikSCAT


Landsat 7

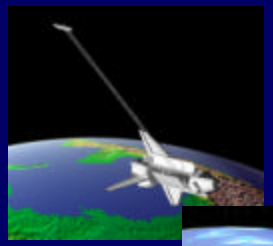

ICEsat


Aqua

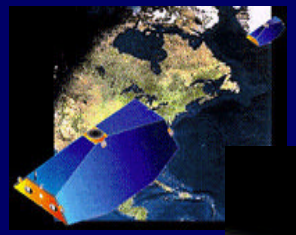

Jason-1


Aura

Exploratory - Explore Specific Earth System Processes


SRTM

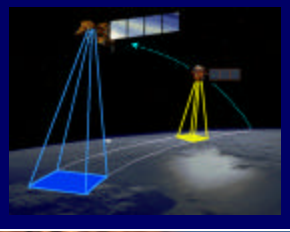

VCL

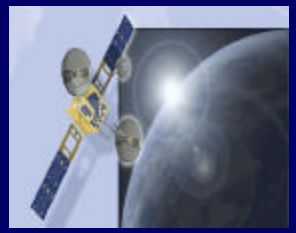

GRACE


CALIPSO

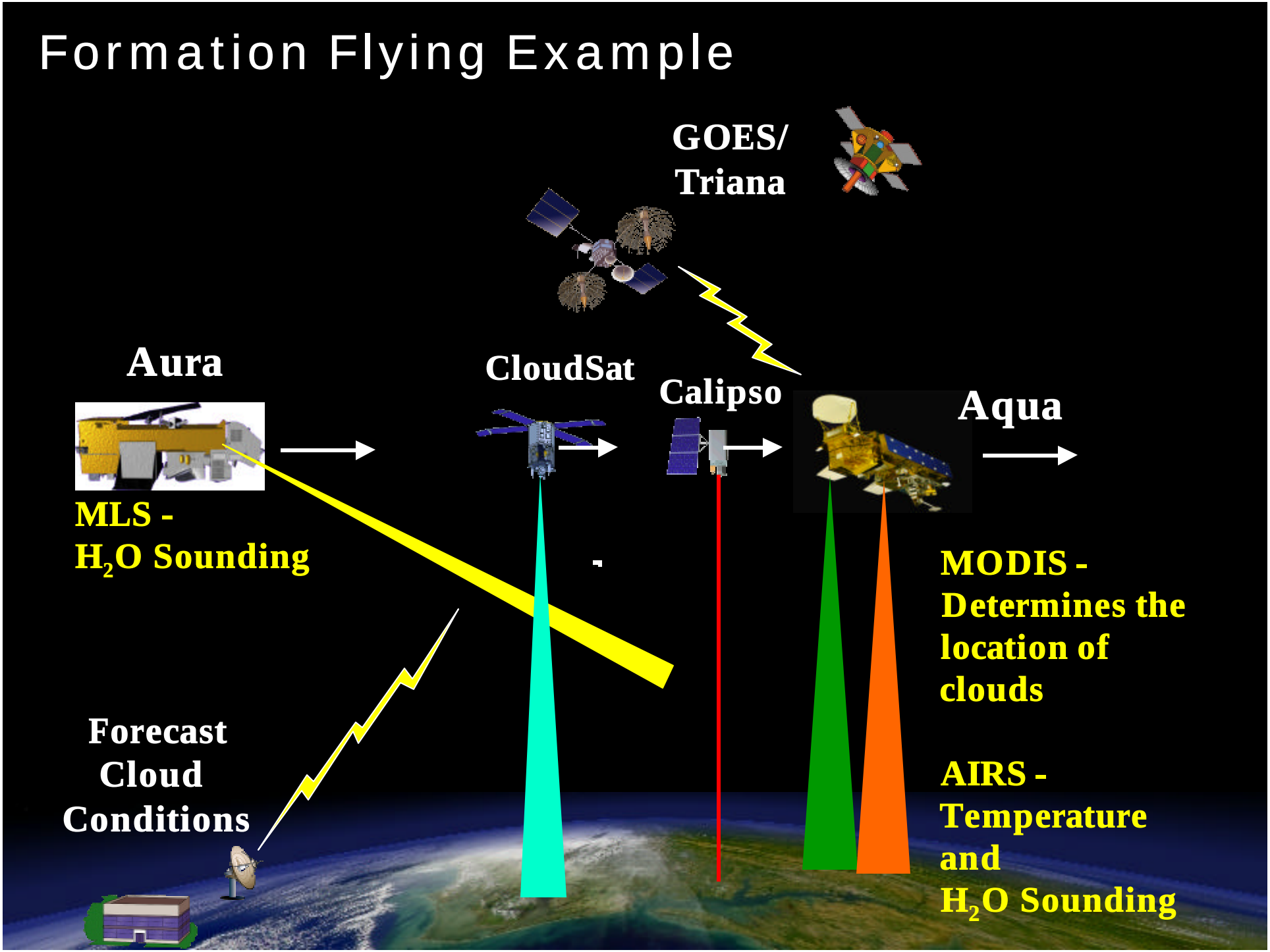

Cloudsat

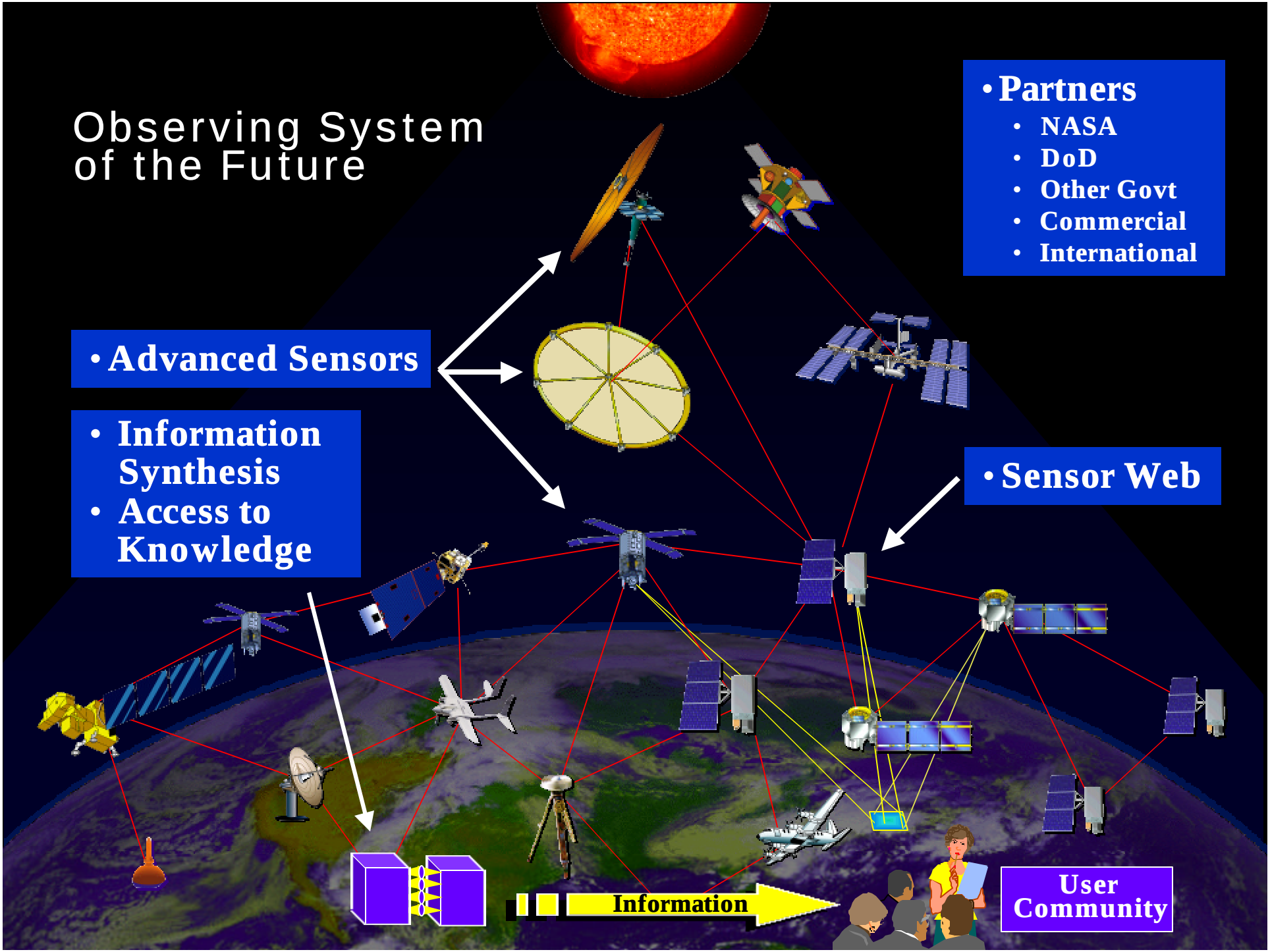
Technology Demonstration


EO-1


EO-3

Formation Flying Example




Observing System of the Future
• Partners
• NASA
• DoD
• Other Govt
• Commercial
• International
• Advanced Sensors
• Information Synthesis
• Access to Knowledge
• Sensor Web
Information
User Community

From Data to Decision Support

What crops should I grow next summer?

Petabytes

Multi-platform, multi-parameter, high spatial and temporal resolution, remote & in-situ sensing

Autonomous, In-space Calibration and Data Reduction

Terabytes

Interaction Between Modeling/Forecasting and Observation Systems

Gigabytes

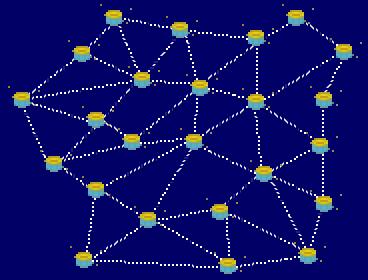
Interactive Dissemination

Predictions

Megabytes

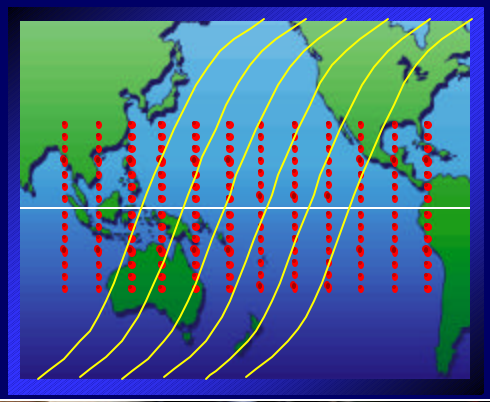
Advanced Sensors

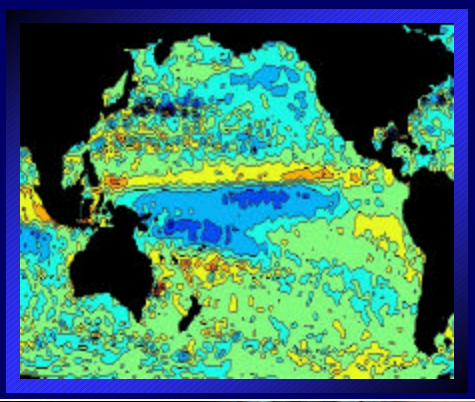
Sensor Webs

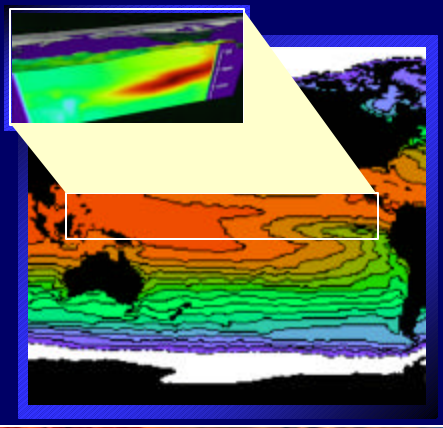


Information Synthesis

Access to Knowledge







Enabling Earth System Prediction

	TODAY	Goals for 2010
Weather	3-Day forecast at 93%*	5-Day forecast at >90%*
	7 Day forecast at 62%*	7-10 Day forecast at 75%*
	3 day rainfall forecast not achievable	3 day rainfall forecast routine
	Hurricane landfall +/-400Km at 2-3 days	Hurricane landfall +/-100Km at 2-3 days
	Air quality day by day	Air quality forecast at 2 days
Climate	6-12 month seasonal prediction experimental; achieved an understanding of El Nino mechanics	6-12 month seasonal prediction routine; 12-24 months experimental
	Decadal climate prediction with coarse models and significant uncertainties in forcing and response factors	10 year climate forecasts experimental; moderate to high confidence in forcing & response factors
Natural Hazards	Demonstrate centimeter-level measurement of land deformation	Continuous monitoring of surface deformation in vulnerable regions with millimeter accuracy
	Accurate characterization of long-term tectonic motions, but no short-term earthquake forecast capability	Improved temporal dimension of earthquake & volcanic eruption forecasts
	Accurate characterization of volcanic activity, but no long-term prediction accuracy	Improve post-eruption hazard assessment

** Accuracy refers to sea level pressure forecasts over Northern Hemisphere during winter.*

Back up

Systematic Measurement Missions

EOS Era

Terra, Aqua

Landsat 7

TRMM

TOPEX, Jason

QuikSCAT, SeaWinds

TOMS, OMI

ACRIMsat, SORCE

- **NPOESS Preparatory Project (2005/06)**
- **Landsat Data Continuity Mission (2005)**
- **Global Precipitation Mission (2007)**
- **Ocean Topography Mission (2006)**
- **Ocean Surface Winds (2006)**
- **Total Column Ozone/Aerosols (2008)**
- **Solar Irradiance (2006)**

Exploratory Measurement Needs

How are global precipitation, evaporation, and the cycling of water changing? (V1)	Soil moisture
What are the motions of the Earth and Earth's interior? (V6)	Gravity field (*GRACE*)
What trends in atmospheric constituents and solar radiation are driving global climate? (F1)	Stratospheric aerosols *(PICASSO)*
How is the Earth's surface being transformed…? (F2)	Land surface topography/deformation
What are the effects of clouds and surface hydrological processes on climate change? (R1)	Cloud particle properties *(Cloudsat)*
How do ecosystems respond to and affect global environmental change and the global carbon cycle? (R2)	Snow cover/Freeze-thaw transition
How can climate variations induce changes in global ocean circulation? (R3)	Biomass changes *(VCL)*
How do stratospheric trace constituents respond to change in climate and chemical composition? (R4)	Carbon sources & sinks
How is global sea level affected by climate change? (R5)	Ocean salinity
What are the effects of regional pollution on the global atmosphere…? (R6)	Sea ice thickness
	Atmospheric properties in tropopause region
	Ice sheet velocity fields
	Tropospheric ozone & precursors